STRENGTHENING COOPERATION BETWEEN UNIVERSITY AND ENTERPRISE TO DEVELOP CONTINUING ENGINEERING EDUCATION

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Abstract: *Development of continuing education program is an important approach that helps establish consummation lifelong education system. The practice of developing continuing education in cooperation between university and government, university and enterprise is introduced in this paper. There are three parts: 1) delivering new high technology training programs in collaboration with government and enterprises, 2) delivering engineering graduate degree education programs for the working graduates and 3)* establishing highly qualified professional team for teaching in collaboration with enterprises*. Both cooperating parties improved the quality of continuing education and sharpened the personnel training ability.*

Keywords: *cooperation, university, government, enterprise, training*

The economical and informational globalization has greatly increased the competitions among nations that are well developed in economics, science and technologies, national defense, and national cohesiveness/unity. This global competition has brought the urgent need of talent resource, one of the key and important components of human resource. In 1965, Paul Lengrand formally proposed the concept of “Lifelong Education” at the Advancement of Adult Education Conference in the United Nation. Since then, lifelong education has created an important basis for many nations’ education system. Furthermore, the fast paced science and technology development in today’s information age has made lifelong education become not only necessary, but also a common desire just for the purpose of promoting human's well-rounded development, ultimately for economic development and social progress. American educator, Martin Trow, pointed out, if a country intends to realize the popularity of higher education, it has to develop short-term education, which is one of the fundamental models of continuing education.

Looking at the experience from developed nations, it is recognized that national development depends on the wealth of natural resources, capital resources, as well as on human resources. Although China’s natural resource reserve is among the top in the world, but the average of per person reserve is very limited. In addition, China’s natural resource utilization has not been well planned yet and there is no absolute advantage in natural resources. Even the fund resource in China is rich, but the financial market is still developing. In comparison with these resources, human resources or talent resources demonstrate the great potential. However, the educational level of China’s human resources is much lower than that of the developed nations, from the perspective of analyzing 900 millions of working population of China, e.g., (a) the level of formal education; (b) the quality of talented personnel; and (c) the employment structure. It is very obvious for lacking of qualified human resource in China. Overall, the population of talented resource is low; comparing with the need in the market, China is still in need of great amount of highly qualified scientists and researchers in the filed of high technology and science. Furthermore, China is also lack of a pool of work forces that are equipped with modern management knowledge or skills at an international standard level, which has seriously hindered the speed of China’s economic and social development.

As pointed out by the Central State Council of China recently in one of its government reports - “the resources of human talents are one of the critical solutions in meeting the challenges derived from global competitions as well as in developing Chinese national enterprises…..” “The issue of human talents becomes significant in today’s world, where the changes are constant and fast in all fields and at all dimensions…” “In short, talented human resources demonstrate an escalating vital significance in the comprehensive national strength competition.” Further, a report, issued at the Chinese Seventeen National Congress, stated, “In order to increase the national productivity, we must concentrate on economic development, enhance capital construction, and build talented work forces, because well-educated and talented work force is the key to implementing nation’s developmental strategies.” These statements clearly indicated that the Chinese government has placed priority on human resource development and education of talented work force. The distance learning and continuing education fall into this priority category. Therefore it is a key element that forms a foundation in promoting lifelong learning in the entire Chinese population and society.

I. The Cooperation between Universities and The Enterprises Is A Common Need For Mutual Development

The continuing education is an important way of developing human resources and also constructing lifelong education system. Industry and enterprises are economic entities of national productivity and basis of capital construction. University is the continuing education training ground for these industry and enterprises. The continuing education is an important constituent of China’s higher education and the important supplement of the traditional education. In order for the university to educate a compatible and adaptable talented work force, increase the level of scientific research and the achievement in scientific research conversion rate, there must be an establishment of a close cooperation with enterprises. Through cooperation with enterprises, the university can accurately map out its own development direction, improve teacher's practical ability, enhance the education quality and strengthen its personnel training capability.

On the other hand, enterprise comprises the main body of continuing engineering education. Domestically, many enterprises embrace continuing education as its “Life Support System”. It is also recognized that the quality of these programs can be started right at the high level only if they are supported or collaborated with universities. Enterprises may obtain the twice effect with half the effort if they work closely with universities. To grow and succeed, there is a mutual need for both enterprises and universities to develop continuing education. The collaboration is the direction and path of the development of continuing education. Recently, continuing engineering education in China is rapidly developing in both theory and practice, and has achieved remarkable successes. Continuing engineering education plays an important role in improving Chinese professional quality, advancing technology, and speeding development of national economy.

II. The Practice of Developing Continuing Education in Cooperation between University and Government as well as University and Enterprise

In order to meet the needs of continuing engineering Education among population in varying degrees and situations, Beijing Institute of Technology (BIT) pays attention to continuing education training work. A Vice President of BIT is in charge of continuing education. A deputy director in education administration of BIT takes responsibilities for key administrative work. Deans of each school assign managers to be in charge of continuing education programs offered through their school. From the university level, BIT plays a positive role in International Association Continuing Engineering Education. BIT has attended and presented on the world conference of continuing engineering education. BIT understands the development and trend of continuing engineering education and applies new theories learned in a timely fashion. The

continuing education management team of BIT meets periodically to summarize experiences, to explore ideas of reform, and to carry out scientific management of continuing engineering education in this environment of changing markets. BIT has been offering Multi-level, multi-form, and multi-specifications of the continuing engineering Education to serve the society and country's economic construction. We will introduce our method, results and outcome, and successful experiences.

1. Delivering new high technology training programs in collaboration with government and enterprises

The mission of continuing engineering education program at BIT is to provide services to the state government, enterprises, and the economy of the Capital (Beijing of China) for the purposes of training and cultivating high-level personnel. BIT built partnerships with local government and enterprises and developed a variety of continuing educational programs. BIT formulates instruction plan according to the demand of government and enterprises. The content of training courses primarily focuses on new theories, technologies and achievements. The course delivery methods are multiple, including seminars or studies on specific topics that are their own cases. BIT supports flexible learning on and/or off campus, so that to assist the government and enterprises. Up to date, BIT has trained over 10,000 person-times, most of which became the nuclear work force and mainstay in different governmental agencies, enterprises and institutions in China. They have improved the political and the quality of ideological thinking, expanded the professional knowledge and improved the knowledge structure, and certainly increased the capacity of decision-making and management level.

Since 2000, BIT has organized or assisted the central government in offering and continuing educational programs that trained government administration cadres. These programs included, for example, Methods of Leadership, Art of Leadership, E-government Administration, etc. About a thousand cadres from the government are trained in these classes. Some of the trainees are from departmental and bureau level at central or local government, some from division level, or from the Chinese government cadres reserve pools.

One instance out of many, BIT cooperated with the Ministry of Personnel of Yunnan Province, that is far from the center of China and lack of educational resources. BIT helped Yunnan Province develop their continuing education programs for the need of the local economic development. A total of 160 managerial and scientific and technical personnel were trained at BIT campus, the courses covered a broad spectrum, such as Western Region Management and Development of Education, Administration and Management of Science and Technology, Chemical Engineering and Senior Financial Management cadres, etc.

2. Delivering engineering graduate degree programs for the working graduates

For many years, in collaboration with enterprises, BIT has provided services to corporate in training skilled talents at various levels by using different schooling formats. BIT cooperated with several enterprises to develop the engineering Master degree programs for enterprise oriented training graduate students. Through enhancing the cooperation among production, learning, and research, BIT helped the local industries promote economical development. At the same time, the university’s relevance disciplines had opportunities to be well constructed, reformed and developed.

Master Program of Chemical Engineering Chemical Engineering and Environment of BIT (CEE of BIT) has been created since 1997. For the last ten years, in cooperation with several enterprises, including Xi'an Modern Chemistry Institute, Qingyang Chemical Industry, Xingan Chemical Industry, and Qiqiang Chemical industry, BIT offered six engineering Master programs in chemical engineering major. Students were recommended at the basic level, and have passed strict entrance examination and verification. Both Graduate School and Department of Chemical Engineering of CEE of BIT and the Ministry of Education personnel of the enterprises

are specifically responsible for management in teaching of the Master program. The teaching quality and effectiveness are periodically and jointly inspected. The regular conferences were held to investigate how to improve the quality of education and reward good people and practice. Through the smooth communications between managers from university and enterprises, the problems are often solved in a timely manner, which ensures the quality of Master Program.

In this Master Program, all graduates are part-time and off campus students. To ensure students to concentrate on classes and study, enterprises have to relocate reasonable amount of study time to the graduate students. Teaching and testing of one course is focused on at a single time. Each class has its own student commission who checks on student attendance. The features of courses designed in Master Program are a combination of introductions of basic/classic theories as foundation and applications of new technology and methods. The research topic of graduate students is designed based on a student's real work and comes from their actual engineering project. In order to guarantee the quality of teaching, besides having university professors as mentors, each student also has senior engineers from enterprises as their co-mentors. Thus, a committee of a Master student for oral examination is composed of BIT and enterprise personnel who hold high-level/senior titles. BIT follows strictly with the rules issued by National Degree Committees of China to oversee the teaching management process and guarantees the education quality. Regarding student who has not completed dissertation on time, the time of study for this student is extended according to the Ministry of Education's stipulation.

Up to 2006, a total of 142 students participated in the study and graduated, of which, one hundred of thirty students obtained Chemical Engineering Master's degree. Through Engineering Master Program training, graduate students increased their theoretical level and were able to solve actual engineering problems. Most of these trained graduates have become the nuclear work force and backbone in enterprises and institutions. An overwhelming majority of the graduates has stepped onto various levels of leadership post, holding the post of branch factory manager and research institute manager. Some of them have become chief engineers, general managers, chief executive officer, and high-level leaders of their respective enterprises. They have assumed great responsibilities in enterprises and contributed significantly to enterprise construction and technological innovation, which has brought the economic efficiency to the enterprises. This program also provided an opportunity for university professionals to sharpen their capability in engineering practice. Both sides from university and enterprises have strengthened the scientific research exchange and the cooperation. Dr. Jinnan Chen taught two degree-courses in this Program. The evaluations from both enterprises and students on Dr. Chen were excellent. She received an award through a Notice of Communication issued by higher level of the department of government.

3. Establishing highly qualified professional team for teaching in collaboration with enterprises

In recent several years, due to completions of doctoral degree or post-doctoral programs, many professors/instructors were recruited by CEE of BIT. A professional teaching team originally composed of 40 has been increased to close to 80. Although new young professors/instructors have doctoral degrees, they lack specialized knowledge and experiences. These members of our teaching team basically come from one school to another school. The Committee of CEE of BIT analyzed the situation of the teaching team and decided to establish training base for instructors and professors in enterprise. CEE of BIT obtained positive responses as well as their strong support of the higher authority leaders at enterprises and government. CEE of BIT and Qingyang Chemical Industry have signed continuing education agreement. Based on the agreement, CEE of BIT will provide training to the enterprise, the courses are conducted at various formats at various levels and Qingyang Chemical Industry will provide practice and the teaching bases for students and the teaching team members of CEE of BIT. Every year, they have to summarize the experience of the continuing education program,

and then formulate implementation plans of education program for the next year.

In order to guarantee the full execution of training plans, the university requires that young teachers who are 35 years old or below to participate in the production practice to enhance their practice and scientific research abilities. The plan will include certain amount of practicing workload that encourages young teachers to participate in production practice. The people in charge of enterprise and school will arrange the practical practice together.

During the summer vacation of 2007, led by the Associate Dean of Education Administration, fourteen young faculty members of CEE of BIT went to practical training Qingyang Chemical Industry for two weeks. The enterprise's technicians and engineers taught the technical process of petroleum chemical products and introduced existing technical problems that factory had been facing and needing urgent solution. The young faculty members visited four branch factories, and understood the real existing technical problems at this petroleum chemical industry. The young faculty members and the technicians and engineers had a chance exploring research questions that can be developed into potential collaborative projects. The teachers brought test and experimental sewage samples with them to university laboratories. All of those young teachers felt that they learned a lot and the practical training is useful for their future teaching. Although this activity is only new attempts, but the advantage of collaboration between the university and the enterprise is readily apparent. The school has determined to conduct practical training plan for young teachers every year.

III. Conclusions

Our practices presented in this paper have showed that a development of many formats of continuing education program through strengthening cooperation between university and government, enterprise is essential, as it can satisfy societies' needs and promote the economical development. Moreover, continuing education is an effective way of collaborative training high level of professional talents.

1. Both university and enterprise must pay close attention to the construction of a highly effective administrative management team to ensure success in the continuing education process. Strengthening top management and administration at each level is a key component in the implementation of continuing education.
2. Both universities and enterprises have to strictly follow with the policies issued by National Degree Committee of China that apply to regulations of trained on-the-job graduate student. Otherwise the engineering master programs will not achieve their training and educational goals and requirement as anticipated.
3. Both universities and enterprises have to jointly formulate program training plans and concrete content. The training content has to primarily include the new theories, technologies, and methodologies. Additionally, it is worth stating that the training content more useful and valuable for students of enterprises if it is integrated nicely with the realistic demands from the enterprise. A training program which has achieved this goal is the most effective and is welcomed by the industry.
4. Both universities and enterprises have to budget program expenses well in order to guarantee the program moving forward. Human resource management of enterprises should always make a budget that covers investment on development of enterprise human resources.
5. Through cooperation between university and enterprise, the communication of educators, engineers and technicians are greatly enhanced. They developed research projects that are commonly interested by both universities and enterprises. This does not only speed up the process of transforming scientific research products , but also helps solve those urgent problems of enterprise. Both universities and enterprises can then share intellectual properties of scientific research and technology.

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